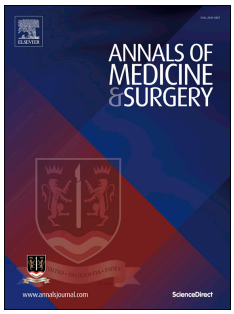
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.



Clinical Characteristics and Prognosis of COVID-19 patients in Syria: A cross-sectional multicenter study

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Clinical Characteristics and Prognosis of COVID-19 Patients in Syria: A cross-sectional Multicenter Study

ABSTRACT:

Background: COVID-19 ignited a global pandemic that, in Syria, further strained a nation and its healthcare system already ravaged by years of war and sanctions. The first case in Syria was reported on March 22, 2020, and this is the first study that aimed to describe the clinical characteristics, comorbidities, and prognosis of COVID-19 patients in Syria. ***Materials and Methods:*** Demographic and clinical data for this cross-sectional prospective study were collected on COVID-19 patients with positive polymerase chain reaction tests who were admitted to Al Assad and Al Mouwasat university hospitals between April 1 and January 31 of 2021. ***Results***: This study included 701 patients. The majority were over age 60 (59%) and male (67.9%). The commonest symptoms were fever (86.6%) and shortness of breath (75.6%). The commonest comorbidities were hypertension(53.9%) and diabetes mellitus (41.5%). On multivariable analysis, risk factors found to be significantly associated with poor outcomes were advanced age (≥60 years); male gender; high respiratory rate (>35); respiratory failure (PaO_2/FiO_2 ratio<100); heart failure; chronic lung disease; elevated white blood cell counts, lactate dehydrogenase, c-reactive protein; prolonged international normalized ratio; and low lymphocyte counts. The clinical outcomes of our patients were as follows: 59.2% improved and were discharged from the hospital, 3.5% were discharged with persistent symptoms and 37.2% died. ***Conclusion***: Several biomarkers can serve as early warning and prognostic indicators of severe illness and mortality from COVID-19 in the highest risk patients, especially males with multiple comorbidities over 60 years of age. In the context of a national healthcare system stretched thin by years of civil war and sanctions, and high COVID-19 mortality rates as a consequence, extra care should be taken to use the predictive power of these biomarkers to stratify high-risk patients in the earliest possible stages of the disease to minimize severe illness and reduce fatalities.

Keywords:
COVID-19, prevalence, clinical characteristics, prognosis, Syria

1. BACKGROUND:

On December 31, 2019, an outbreak of pneumonia cases linked to an aggressive novel coronavirus was reported in Wuhan, China. The new virus, severe acute respiratory syndrome coronavirus (SARS-CoV-2), is responsible for coronavirus disease 2019 (COVID-19), which began to spread uncontrollably[1]. On January 30, 2021, the World Health Organization (WHO) declared the COVID-19 outbreak an international public health emergency and by March 11, 2020, it had erupted into a full-blown global pandemic. All over the world, even the most robust healthcare systems were quickly overwhelmed, global economies were crippled, and social and political landscapes were thrown into a state of upheaval. These devastating effects were exacerbated in Syria when the pandemic ripped through a nation that had already been ravaged by a brutal decade-long civil war, crippling sanctions, and the largest refugee crisis since World War II [2]. Even before the first Syrian case of COVID-19 was reported, the risk to Syria was classified by the WHO's global risk assessment as "very high" due to a decimated healthcare system and vulnerable population (90% of the population lives under the poverty line, and more than half them are internally displaced refugees)[3, 4]. Years of armed conflict, political unrest, and socio-economic deterioration left Syria's healthcare network in a fractured and overburdened state utterly

incapable of containing the pandemic. To avoid the country plunging into an even deeper humanitarian crisis, Syrian authorities sought to contain the influx of COVID-19 by imposing strict precautionary travel and border control measures in early March 2020, before the first domestic case was even announced on March 22, 2020[5, 6]. Immediately following that announcement, broader mitigation measures were adopted nationwide on March 24, 2020, and included curfews, school, and university closures, reduced staffing at public institutions, and enhanced COVID-19 surveillance[6]. Within the healthcare system, massive efforts were focused on identifying and treating high-risk cases in the early stages of the disease to minimize the utilization of limited resources and avoid overwhelming the country's health systems. These early containment and mitigation measures seemed initially successful at keeping the number of COVID-19 cases relatively low. However, once these measures (curfews, travel bans, school closures, etc.) were lifted at the end of May 2020, the number of cases spiked, and by August 30, 2021, there were 27,325 cases and 1,989 deaths[5]. This study aims to describe the demographic characteristics, clinical profile, comorbidities, and outcomes of hospitalized patients diagnosed with COVID-19 in Syria between April and January 2021.

2. Materials and Methods:

2.1. Study Design and Participants:

In this cross-sectional prospective multicenter study that included 701 patients, inclusion criteria were as follows: patients diagnosed with COVID-19 based on positive real-time reverse transcriptase-polymerase chain reaction (RT-PCR) assays of nasopharyngeal swab samples and admitted to Al Assad or Al Mouwasat University Hospitals between April 1, 2020, and January 31, 2021. Patients were followed up for clinical outcome assessment until February 28, 2021. Specimens were collected and analyzed according to the Centers for Disease Control and Prevention (CDC) guidelines[7].

2.2. Data collection and procedures:

The Syrian Ministry of Health designated Al Assad University Hospital and AL Mouwasat University Hospital, two of the largest teaching hospitals in Syria, as dedicated centers for treating COVID-19 patients in Damascus. The study data collected from these facilities included epidemiological and demographic data, medical and exposure histories, comorbid conditions, clinical characteristics, biomarkers including vital signs and laboratory results, management, complications, length of hospital stay, and clinical outcomes. The biomarkers thought to be most relevant and subject to statistical analysis were selected based on the experience of the attending physicians and several published studies at the time, and were recorded at the time of admission[8-11]. The main clinical outcome measures were death, recovery, and post-discharge persistent symptoms ([PDPS]: dyspnea or increased respiratory effort, fatigue, post-exertional malaise, insomnia and other sleep difficulties, impaired daily function and mobility, and cognitive impairment). The patients were classified into four groups based on illness severity: mild, moderate, severe, and critical. Mild illness was defined as mild clinical symptoms without radiological manifestations of pneumonia. Moderate illness was defined by the presence of respiratory symptoms and pneumonia on imaging. Severe illness was defined by the presence of one of the following: respiratory rate (RR) of ≥30 per minute, oxygen saturation (SaO_2) of ≤93% at rest, or a ratio of arterial partial pressure of oxygen to fraction of inspired oxygen (PaO_2/FiO_2) ≤300 mmHg. Critical illness was defined by any one of the following: respiratory failure which required invasive mechanical ventilation, multiple organ failure, or shock which mandated admission to the ICU. All discharged patients were followed up for 4 weeks. Outcome assessments were

based on telephone interviews with either patients, their family members, or the patient's physician in case of discharge and transfer of care to another healthcare provider.

Mathew G and Agha R, for the STROCSS Group. STROCSS 2021: Strengthening the Reporting of cohort, cross-sectional and case-control studies in Surgery. International Journal of Surgery 2021;96:106165 **[12].**

2.3 Statistical Analysis:

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were used to describe patients' demographic characteristics, past medical and exposure histories, comorbidities, clinical characteristics, laboratory results, management, complications, length of hospital stay, and clinical outcomes. Continuous variables were reported as means(± standard deviation [SD]). Categorical variables were reported as frequencies and percentages (%), which were compared using a chi-squared (χ^2) test, when appropriate. A value of $P<0.05$ was considered significant for all analyses.

2.4 Ethical statement

This study was approved by the institutional ethics board of Damascus University (IRB 2020/1404). The obligation of written informed consent was waived by Damascus University's ethics committee due to the urgent need for data collection.

2.5 Registration of research studies:

1. Name of the registry: Clinical Characteristics and Prognosis of COVID-19 Patients in Syria: A cross-sectional Multicenter Study
2. Unique Identifying number or registration ID: 7904.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): https://www.researchregistry.com/browse-the-registry#home/

3. RESULTS:

3.1. Demographic Characteristics

A total of 701 patients were included in this study; more than half of them were over the ages of 60 years 420 patients (59%), while only 48 patients 6.8% were between the age of 15 and 39 years. Most of the patients were male 476(67.9%). Only 18 (2.6%) of patients were health workers. The source of infection was unknown in the majority of patients 645 (92%) Table (1).

3.2. Clinical Characteristics

The most common symptoms at the time of hospital admission were fever with or without chills in 607 patients (86.6%), followed by shortness of breath in 600 patients (75.6%), fatigue in 517 patients (73.8%), and cough in 495 patients (70.6%) Table (1).

3.3. Comorbidities

The most common comorbidity was hypertension(HTN) in 378 patients (53.9%) followed by diabetes mellitus in 291 patients (41.5%).

3.4. Findings on Admission

About half (53.4%) of patients had normal white blood cell (WBC) counts (reference range [RR] = 4400 to 11000 per mm^3); only 46 patients (6.6%) had WBC counts lower than 4400. Most patients had abnormal WBC differentials: 577 patients(82.3 %) had high neutrophil counts (>70% of total WBCs) and 593 patients (84.6%) had low lymphocyte counts (<20% of total WBCs). C-reactive protein(CRP) values (RR <5 mg/dL) were moderately elevated (5.1 to 20 mg/dL) in 316 patients (45.1%), markedly elevated (20.1 to 50 mg/dL) in 115 patients (16.4%), and severely elevated (>50 mg/dL) in only 63 patients (9%) Table (3).

3.5. Clinical outcomes

The majority of our patients (378, 59.2%) recovered and were discharged from the hospital, 261 patients (37.2%) died, and 25 (3.5%) were discharged but experienced persistent symptoms. On multivariable analysis, we found significant associations between clinical outcomes and the following biomarkers: age, gender, blood pressure (BP), SaO_2 at admission, respiratory rate (RR), quick sequential organ failure assessment (qSOFA) score, WBC, lymphocyte differential count, PaO_2/FiO_2, creatinine (Cr), urea, lactate dehydrogenase (LDH), creatinine kinase(CK), blood glucose(Glu), international normalized ratio (INR), alanine aminotransferase (ALT), aspartate aminotransferase (AST), c-reactive protein (CRP) and ventilatory support status (*P*-value <0.05) table (4).

3.6. Respiratory Support

Most patients (442, 63.1%) required oxygen therapy. Non-invasive ventilation was needed in 96 patients (13.7%), half of whom (47, 6.7%) required subsequent intubation, while 101 patients (14.4%) required immediate intubation. Table (5).

4. DISCUSSION:

Characteristics

This study was conducted during the first and second waves of the pandemic in Syria. The Syrian civil war had been raging for nearly ten years, the disastrous effects of which were compounded by the arrival of the COVID-19. Data collection on our population of 701 patients from two of Damascus's dedicated COVID-19 hospitals started during the first lockdown, before the number of cases skyrocketed due to the easing of curfews and other restrictions, and continued until the end of the second wave. The ongoing war eliminated 40% of Syria's hospitals and primary care facilities. Combined with other political and economic pressures, including severe sanctions, what was left of Syria's healthcare system was severely overburdened, and access to it was limited. The extent to which the healthcare system was unprepared for the pandemic is evidenced by the high rate of COVID-19 deaths in the general population, which is 6% in Syria, compared to approximately 1% in its more stable neighbors Jordan, Lebanon, and Iraq[13]. Similarly, our study found a 37% case fatality rate among hospitalized COVID-19 patients, nearly double the 19% rate from a Lebanese study. This may be since the majority of this population was of advanced age with multiple comorbidities. By the time of hospital admission, many were in the late stages of the disease and had suffered extensive parenchymal lung damage, mandating immediate placement on high oxygen or ventilatory support if available. Our findings are consistent with evidence from previous studies suggesting that male gender and advanced age are predictors of higher mortality[14]: compared to females, males with COVID-19 had a higher rate of in-hospital mortality (39.7% [189] vs. 32% [72]); nearly half (47.4%, 199) of patients over the age of 60 died.

HCWs only accounted for 2.6% (18) of this study population, which is lower than in studies from Iran (5.6%) and New York (6.8%), but similar to the 2% rate found in a Chinese study[15-17]. The low number of HCWs that were admitted despite being highly exposed to COVID-19 may be attributed to any number of reasons. First, most younger and healthier HCWs experienced only mild symptoms. Furthermore, the private healthcare sector expanded rapidly to fill the gaps left by an overstretched and under-resourced public health system. This included private hospitals, house-calls by healthcare providers to treat patients at home, and services that delivered oxygen tanks directly to people's homes.

Biomarkers:

Several studies have shown that low lymphocyte count and elevations in LDH, WBC, neutrophil counts, creatinine, and CRP can be reliable early warning indicators of severe COVID-19 [8, 18-21]. Our study confirms the reliability of these biomarkers as prognostic indicators associated with disease severity and increased risk of ICU admission and mortality. Elevated WBC counts (>11000/mm^3) were associated with a higher mortality rate(45.9%, 129) compared to that of patients with normal (4400-11000/mm^3) and decreased (<4400/mm^3) WBC counts, which were 32.9% (123) and 19.6% (9) respectively. Similarly,30.3% (85)of patients with high WBC counts required intubation compared to only16% (60) of those with normal WBC counts and 6.5% (6) of those with low WBC counts. Lymphopenia was a predictor of mortality and increased risk of intubation, especially a lymphocyte differential of <20% [19]. Higher lymphocyte counts were good prognostic indicators: 80.7% (67) of patients with lymphocyte differentials between 20% and 40% improved, as did 72% (18) of patients with lymphocyte differentials of >40%.
Hyperglycemia is known to induce an exaggerated inflammatory response, and a growing number of observational studies have shown that hyperglycemia as a driver of progressive respiratory failure is a strong predictor of morbidity and mortality in hospitalized and critically ill COVID-19 patients[22]. A quarter of patients (42, 24.8%)that were hyperglycemic (BG>250 mg/dL) at admission required mechanical ventilation (MV). Interestingly, however, 3(27.3%) of the hypoglycemic patients (BG<75 mg/dL) at admission also required mechanical ventilation. LDH is an independent predictor of early mortality in severe and critical cases[9]. Nearly a quarter of patients (135, 24.1%) with high levels of LDH (>480 U/L) required MV. By contrast, none of the patients whose LDH<240 were intubated. Elevated AST (>38 U/L)and ALT(>41 U/L) levels are common features in critical COVID-19 cases and were respectively found in 42.8% (134) and 43.1% (85) of deceased patients[23]. Severe inflammation in COVID-19 causes homeostasis derangement and prominent alterations to multiple coagulation parameters[24]. International normalized ratio (INR) prolongation in the context of COVID-19-associated coagulopathy is a poor prognostic indicator[9]. The INR of most patients in this study (510,72.8%) was in the reference range (<1.1). Of those whose INR>3: (66.7%) were mechanically ventilated, and (83.3%) died.

Comorbidities:

HTN was the most common and was associated with an increased risk of cardiac, renal and systemic disease[25-28]. Hypertensive, and diabetic patients are more vulnerable to thrombotic events, which may partially have poorer outcomes in these patients[29, 30]. The presence of HTN was statistically significantly (11,52.4%) associated with ventilatory support demand. Mortality reached 41% in hypertensive patients versus (32.8%) in non-hypertensive patients. DM leads to multiple organ failure and high mortality in COVID patients[31]. The mortality rate was higher in diabetic patients 43% (125) versus only (33.2%) in non-diabetic patients (P<0.05). HF significantly increased mortality: (55.6%) of patients with HF died, whereas only (36%) of non-HF patients died. The need for intubation after noninvasive mechanical ventilation (NIV) in patients with chronic lung disease was high (19%), compared with (5.9%) of patients who do not have chronic lung disease.

Complications and Outcome:

The most common complication was acute respiratory distress syndrome (ARDS)(19.8%), followed by acute kidney injury (6.3%). The overall mortality rate for this study was 261 patients (37.2%). The high mortality rate may be due to delays in seeking medical care, and the Syrian conflict-induced limitations of Syria's healthcare system capacity and lack of resources. Invasive mechanical ventilation was a poor prognostic indicator[9, 32]. The

overwhelming majority (92.1%) of intubated patients died. The increased mortality rate in intubated patients may be related to the timing of MV initiation[26, 33]. NIV was not significantly associated with increased mortality, only 18 (36.7%) of NIV patients died[23]. The highest mortality rate was noted during the first week of hospitalization: (54.4%) of deaths occurred within seven days of admission, and the rate decreased to reach (14.6%) of deaths after two weeks.

Study Limitations:

No laboratory or radiological follow-ups were available and important biomarkers such as IL-6, PCT, D-dimer, and ferritin were not studied due to resource limitations imposed on the healthcare system by the ongoing conflict and the sheer number of cases brought on by the pandemic. Long-term follow-up of discharged patients was difficult to maintain. Confounding with regards to treatment could not be completely controlled. The future implications of this study are to emphasize the need to control the accompanying comorbidities and seek health care from the onset of symptoms in COVID-19 patients especially high-risk patients, males with multiple comorbidities over 60 years of age, to reduce the death rate. Furthermore, in future studies, long-term follow-up including clinical status assessment, laboratory values, specific tests, and radiological features should be considered.

Conclusion

Biomarkers that can serve as early warning and prognostic indicators of severe illness and mortality from COVID-19 include WBC count, lymphocyte differential, INR, and levels of LDH, AST, ALT, and blood glucose. These values are particularly useful in identifying high-risk patients with the highest risks of mortality, especially males with multiple comorbidities over 60 years of age. In the context of a national healthcare system stretched thin by years of civil war and sanctions, and high COVID-19 mortality rates as a consequence, extra care should be taken to use the predictive power of these biomarkers to stratify high-risk patients in the earliest possible stages of the disease to minimize severe and illness and reduce fatalities.

Abbreviations:

COVID-19: Coronavirus Disease of 2019
WHO: World Health Organization
RR: Respiratory Rate
Pao2/Fio2 ratio: Partial pressure of oxygen/ Inspired oxygen as a percentage
WBC: White Blood Cell Count
BUN: Blood Urea Nitrogen
LDH: Lactate Dehydrogenase
CRP: C-Reactive Protein
INR: International Normalized Ratio
RNA: Ribonucleic Acid
SARS-cov2: Severe Acute Respiratory Syndrome Coronavirus Type 2
IRB: Institutional Review Board
RT-PCR: Real-time reverse transcriptase-polymerase chain reaction
CDC: Centers for Disease Control and Prevention
ACE2: Angiotensin-Converting Enzyme Type2
SD: Standard Deviation
SPSS: Statistical package for the social sciences
P-value: Probability value

ICU: Intensive Care Unit
CK: Creatine Kinase
BG: Blood glucose
ALT: Alanine Amino-transferase
AST: Aspartate Amino-transferase
PCT: Procalcitonin
qSOFA: Quick Sequential Organ Failure Assessment
IL-6: Interleukin 6
PT: Prothrombin Time
PTT: Partial Thromboplastin Time
NIV: Non-Invasive Mechanical Ventilation
MV: Mechanical Ventilation
HTN: Hypertension
COPD: Chronic Obstructive Pulmonary Disease
CKD: Chronic Kidney Disease
DM: Diabetes Mellitus
HF: Heart Failure
ARDS: Acute Respiratory Distress Syndrome

Ethics approval and consent to participate:

The study was approved by Damascus University. The obligation of written informed consent was waived by the ethical committee of Damascus university due to the urgency of data collection and the nature of the disease being studied.

Consent for publication:

The study was approved by Damascus University.

Availability of data and materials:

All data generated or analyzed during this study are available from the corresponding author upon reasonable request.

Conflicts of Interest:

The authors declare that they have no competing interests

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Table 1: Demographic And Clinical Characteristics Of COVID 19 Patient (n=701)

Demographic characteristics		N, (%)
Age(year)	15-39	48 (6.8%)
	40-59	233 (33.2%)
	≥60	420 (59.9%)
Admission department	ICU	177 (25.2%)
	Isolation unit	524 (74.8%)
The economic status of patients	Good	181 (25.8%)
	Moderate	342 (48.8%)
	Excellent	92 (13.1%)
	Low	86 (12.3%)
Gender	Female	225 (32.1%)
	Male	476 (67.9%)
Occupation	A health worker	18 (2.6%)
	Not a health worker	506 (72.2%)
	Unemployed	177 (25.2%)
Source of infection	Known	56 (8%)
	Unknown	645 (92.0%)
Body Mass Index	<25	214 (30.5%)
	25-30	347 (49.5%)
	31-35	83 (11.8%)
	36-40	26(3.7%)
	>40	31 (4.4%)
Smoker	No	559 (79.7%)
	Yes	142 (20.3%)
Clinical Characteristics		N (%)
Symptoms	Fever or chills	607 (86.6%)
	Shortness of breath	600 (85.6%)
	Fatigue	517 (73.8%)
	Cough	495(70.6%)
	Diarrhea	167(23.8%)
	Nausea and/or vomiting	166(23.7%)
	Headache	162(23.1%)
	Chest pain	108 (15.4%)
	Neurological symptoms	107(14.9%)
	Sore throat	71(10.1%)
	Loss of taste	62 (8.8%)
	Loss of smell	58(8.3%)
	Loss of appetite	52(7.4%)
	Abdomen pain	4(0.6%)

Table 2: The Relations Between The Need For Ventilatory Support And Comorbidities Of COVID-19 Patients

Patients requiring Ventilatory support						
Comorbidities	Monitoring	Oxygen therapy	Non-invasive ventilation	Invasive ventilation	NIV then invasive ventilation	P-value
Hypertension N=387	25 (6.6%)	245 (64.8%)	24 (6.3%)	58 (15.3%)	26 (6.9%)	0.196
Diabetes mellitus N=291	18 (6.2%)	178 (61.2%)	23 (7.9%)	53 (18.2%)	19 (6.5%)	0.043
Ischemic heart disease N=154	8 (5.2%)	99 (64.3%)	13 (8.4%)	20 (13.0%)	14 (9.1%)	0.234
Chronic kidney disease N=87	9 (10.3%)	60 (69.0%)	2 (2.3%)	13 (14.9%)	3 (3.4%)	0.238
Heart failure N=45	4 (8.9%)	31 (68.9%)	3 (6.7%)	6 (13.3%)	1 (2.2%)	0.782
Chronic pulmonary disease N=42	1 (2.4%)	22 (52.4%)	6 (14.3%)	5 (11.9%)	8 (19.0%)	0.002

Table (3): The Laboratory Findings On Admission Of Covid 19 Patients((n=701)

Laboratory findings on admission		N/%
Quick SOFA score	0	66 (9.4%)
	1	491 (70%)
	2	136 (19.4%)
	3	8 (1.1%)
White Blood cells (WBC) RR:4400-11000 (cu mm3)	< 4400	46 (6.6%)
	4400-11000	374 (53.4%)
	>11000	281(40.1%)
Neutrophils (N) RR: (40-70%)	<40%	18 (2.6%)
	40-70%	106 (15.1%)
	>70%	577(82.3%)
Lymphocytes (L) RR(20-40%)	<20	593 (84.6%)
	20-40	83 (11.8%)
	>40	25 (3.6%)
Creatinine (Cr) RR: 0.7-1.36 (mg/dL)	<0.7	58 (8.3%)
	0.7-1.36	417 (59.5%)
	> 1.36	226 (32.2%)
Urea (Ur) RR: <20 (mg/dL)	<20	25 (3.6%)
	20-50	340 (48.5%)
	>50	336 (47.9%)
Lactate dehydrogenase (LDH) RR:240-480(U/L)	<240	7 (1.0%)
	240-480	134 (19.1%)
	>480	560 (79.9%)
International Normalized Ratio, INR RR: ≤1.1	≤1.1	510 (72.8%)
	1.2- 1.9	170 (24.3%)
	2- 3	15 (2.1%)
	>3	6 (0.9%)
PaO2/FiO2 Ratio	<100	211 (30.1%)
	100-200	246 (35.1%)

	200-300	159 (22.7%)
	>300	85 (12.1%)
Blood glucose (BG) RR: 75-110 (mg/dL)	<75	11(1.6%)
	75-110	156 (22.3%)
	110-250	365 (52.1%)
	>250	169 (24.1%)
Alanine Aminotransferase (ALT) RR: ≤41 (U/L)	≤41	504 (71.9%)
	>41	197 (28.1%)
Aspartate Aminotransferase (AST) RR: ≤38(U/L)	≤38	388 (55.3%)
	>38	313 (44.7%)
C-reactive Protein CRP [range] RR: ≤5 (mg/dL)	< 0.5	12 (1.7%)
	0.5-5	195 (27.8%)
	5.1-20	316 (45.1%)
	20.1-50	115 (16.4%)
	>50	63 (9%)

Table (4): The Relations Between The Clinical Outcomes And Other Characteristics Of COVID-19 Patients

Clinical Outcomes	*P*-

		Improvement	Post-discharge persistent symptoms	Death	value
Age(year)	15-39 (n=48)	38 (79.2%)	3 (6.3%)	7 (14.6%)	0.000*
	40-59(n=233)	174 (74.7%)	4 (1.7%)	55 (23.6%)	
	≥60 (n=420)	203 (48.3%)	18 (4.3%)	199 (47.4%)	
Gender	Male(n=476)	266 (55.9%)	21 (4.4%)	189 (39.7%)	0.017*
	Female(n=225)	149 (66.2%)	4 (1.8%)	72 (32%)	
The economic situation of patients	Good (n=86)	55 (64%)	0 (0%)	31 (36%)	0.117
	Moderate (n=428)	199 (58.2%)	10 (2.9%)	133 (38.9%)	
	Excellent (n=181)	112 (61.9%)	8 (4.4%)	61 (33.7%)	
	Low (n=92)	49 (53.3%)	7 (7.6%)	36 (39.1%)	
Body Mass Index (BMI) (kg/m²)	<25 (n=214)	121 (56.5%)	9 (4.2%)	84 (39.3%)	0.741
	25-30 (n=347)	210 (60.5%)	9 (2.6%)	128 (36.9%)	
	30-35 (n=83)	53 (63.9%)	4 (4.8%)	26 (31.3%)	
	35- 40 (n=26)	16 (61.5%)	1 (3.8%)	9 (34.6%)	
	>40 (n=31)	15 (48.4%)	2 (6.5%)	14 (45.2%)	
Smoker	Yes (n=142)	82 (57.7%)	6 (4.2%)	54 (38%)	0.856
	No (n=559)	333 (59.6%)	19 (3.4%)	207 (37%)	
Blood pressure on admission (BP) mm hg	< 90 (n=18)	7 (38.9%)	0 (0%)	11 (61.1%)	0.018*
	90-120 (n=365)	231 (63.3%)	14 (3.8%)	120 (32.9%)	
	121-140 (n=231)	138 (59.7%)	7 (3%)	86 (37.2%)	
	141-160 (n=66)	33 (50%)	3 (4.5%)	30 (45.5%)	
	≥ 160 (n=21)	6 (28.6%)	1 (4.8%)	14 (66.7%)	
SatO2 on admission %	<85% (n=461)	216 (46.9%)	18 (3.9%)	227 (49.2%)	0.000*
	85-93% (n=179)	147 (82.1%)	5 (2.8%)	27 (15.1%)	
	>93% (n=61)	52 (85.2%)	2 (3.3%)	7 (11.5%)	
Respiration Rate on admission (breaths/min)	12-20 (n=61)	52 (85.2%)	1 (1.6%)	8 (13.1%)	0.000*
	21-29 (n=277)	184 (66.4%)	15 (5.4%)	78 (28.2%)	
	30-35 (n=198)	109 (55.1%)	3 (1.5%)	86 (43.4%)	

	>35(n=165)	70 (42.4%)	6 (3.6%)	89 (53.9%)	
qSOFA score on admission	0(n=66)	58 (87.9%)	1 (1.5%)	7 (10.6%)	0.000*
	1(n=491)	298 (60.7%)	19 (3.9%)	174 (35.4%)	
	2(n=136)	55 (40.4%)	5 (3.7%)	76 (55.9%)	
	3(n=8)	4 (50%)	0 (0%)	4 (50%)	
WBC(on admission cu mm3)	< 4400(n=46)	36 (78.3%)	1 (2.2%)	9 (19.6%)	0.001*
	4400-11000(n=374)	238 (63.6%)	13 (3.5%)	123 (32.9%)	
	>11000(n=281)	141 (50.2%)	11 (3.9%)	129 (45.9%)	
Neutrophils on admission (%)	<40%(n=18)	13 (72.2%)	0 (0%)	5 (27.8%)	0.002*
	40-70%(n=106)	80 (75.5%)	1 (0.9%)	25 (23.6%)	
	>70%(n=577)	322 (55.8%)	24 (4.2%)	231 (40%)	
Lymphocytes on admission (%)	<20%(n=593)	330 (55.6%)	24 (4%)	239 (40.3%)	0.000*
	20-40%(n=83)	67 (80.7%)	1 (1.2%)	15 (18.1%)	
	>40%(n=25)	18 (72%)	0 (0%)	7 (28%)	
Cr on admission (mg/dl)	< 0.7(n=58)	35 (60.3%)	1 (1.7%)	22 (37.9%)	0.000*
	0.7-1.36(n=417)	273 (65.5%)	16 (3.8%)	128 (30.7%)	
	>1.36(n=226)	107 (47.3%)	8 (3.5%)	111 (49.1%)	
Ur on admission (mg/dL)	<20(n=25)	20 (80%)	1 (4%)	4 (16%)	0.000*
	20-50(n=340)	230 (67.6%)	7 (2.1%)	103 (30.3%)	
	>50(n=336)	165 (49.1%)	17 (5.1%)	154 (45.8%)	
LDH on admission ((U/L)	<240(n=7)	4 (57.1%)	0 (0%)	3 (42.9%)	0.000*
	240-480(n=134)	104 (77.6%)	3 (2.2%)	27(20.1%)	
	>480(n=560)	307 (54.8%)	22 (3.9%)	231 (41.3%)	
INR on admission	<1.1(n=510)	317 (62.2%)	17 (3.3%)	176 (34.5%)	0.018*
	1.2-1.9(n=170)	91 (53.5%)	6 (3.5%)	73 (42.9%)	
	2-3(n=15)	7 (46.7%)	1 (6.7%)	7 (46.7%)	
	>3(n=6)	0 (0%)	1 (16.7%)	5 (83.3%)	
PaO2/FiO2 Ratio	<100(n=211)	51 (24.2%)	9 (4.3%)	151 (71.6%)	0.000*
	100-200(n=246)	155 (63%)	9 (3.7%)	82 (33.3%)	

on admission	200-300(n=159)	132 (83%)	5 (3.1%)	22 (13.8%)	
	>300(n=85)	77 (90.6%)	2 (2.4%)	6 (7.1%)	
BG on admission (mg/dl)	<75(n=11)	8 (72.7%)	0 (0%)	3 (27.3%)	0.001*
	75-110(n=156)	116 (74.4%)	6 (3.8)	34 (21.8%)	
	110-250(n=365)	204 (55.9%)	11 (3)	150 (41.1%)	
	>250(n=169)	87 (51.5%)	8 (4.7%)	74 (43.8%)	
ALT on admission (unit/l)	<41(n=504)	313 (62.1%)	15 (3%)	176 (34.9%)	0.032*
	>41(n=197)	102 (51.8)	10 (5.1)	85 (43.1)	
AST on admission (unit/l)	<38(n=388)	246 (63.4)	15 (3.9)	127 (32.7)	0.023*
	>38(n=313)	169 (54)	10 (3.2)	134 (42.8)	
CRP on admission (mg/dl)	< 0.5(n=12)	11 (91.7)	0 (0)	1 (8.3)	0.000*
	0.5-5(n=195)	143(73.3)	9 (4.6)	43 (22.1)	
	5.1-20(n=316)	194 (61.4)	13 (4.1)	109 (34.5)	
	20.1-50(n=115)	57 (49.6)	2 (1.7)	56 (48.7)	
	>50(n=63)	10 (15.9)	1 (1.6)	52 (82.5)	
Respiratory status	Oxygen therapy(n=442)	323 (73.1)	13 (2.9)	106 (24)	0.000*
	Non-invasive ventilation(n=49)	24 (49)	7 (14.3)	18 (36.7)	
	Invasive ventilation(n=101)	5 (5)	3 (3)	93 (92.1)	
	Non-invasive ventilation then Invasive ventilation(n=47)	4 (8.5)	0 (0)	43 (91.5)	
	Monitoring(n=62)	59 (95.2)	2 (3.2)	1 (1.6)	

Table 5: The Relations Between The Need For Ventilatory Support And Other Characteristics Of COVID-19 Patients

		Ventilatory support	P-value

		Monitoring	Oxygen therapy	Non-invasive ventilation	NIV then invasive ventilation	invasive ventilation	
Age (year)							
	15-39 (n=48)	13 (27.1%)	25 (52.1%)	5 (10.4%)	0 (0%)	5 (10.4%)	
	40-59 (n=233)	28 (12%)	156 (67%)	18 (7.7%)	8 (3.4%)	23 (9.9%)	0.000*
	≥60 (n=420)	21 (5%)	261 (62.1%)	26 (6.2%)	39 (9.3%)	73 (17.4%)	
Gender							
	Male (n=476)	43 (9%)	296 (62.2%)	30 (6.3%)	33 (6.9%)	74 (15.5%)	0.611
	Female (n=225)	19 (8.4%)	146 (64.9%)	19 (8.4%)	14 (6.2%)	27 (12%)	
Economic status							
	Low (n=92)	11 (12%)	42 (45.7%)	11 (12%)	9 (9.8%)	19 (20.7%)	
	Moderate (n=342)	31 (9.1%)	224 (65.5%)	14 (4.1%)	17 (5%)	56 (16.4%)	0.001*
	Good (n=86)	1 (1.2%)	64 (74.4%)	6 (7%)	6 (7%)	9 (10.5%)	
	Excellent (n=181)	19 (10.5%)	112 (61.9%)	18 (9.9%)	15 (8.3%)	17 (9.4%)	
BMI							
	<25 (n=214)	25 (11.7%)	130 (60.7%)	8 (3.7%)	14 (6.5%)	37 (17.3%)	
	25-30 (n=347)	33 (9.5%)	229 (66%)	18 (5.2%)	19 (5.5%)	48 (13.8%)	0.000*
	30-35 (n=83)	2 (2.4%)	57 (68.7%)	10 (12%)	3 (3.6%)	11 (13.3%)	
	35-40 (n=26)	1 (3.8%)	14 (53.8%)	4 (15.4%)	3 (11.5%)	4 (15.4%)	
	>40 (n=31)	1 (3.2%)	12 (38.7%)	9 (29%)	8 (25.8%)	1 (3.2%)	
Smoker							
	Yes (n=142)	11 (7.7%)	95 (66.9%)	11 (7.7%)	11 (7.7%)	14 (9.9%)	0.455
	No (n=559)	51 (9.1%)	347 (62.1%)	38 (6.8%)	36 (6.4%)	87 (15.6%)	
BP							
< 90	< 90 (n=18)	2 (11.1%)	11 (61.1%)	0 (0%)	3 (16.7%)	2 (11.1%)	
90 - 120	90-120 (n=365)	37 (10.1%)	235 (64.4%)	27 (7.4%)	20 (5.5%)	46 (12.6%)	0.009*
121 - 140	121-140 (n=231)	20 (8.7%)	144 (62.3%)	17 (7.4%)	11 (4.8%)	39 (16.9%)	
141 - 160	141-160 (n=66)	3 (4.5%)	42 (63.6%)	5 (7.6%)	7 (10.6%)	9 (13.6%)	
≥ 160	≥ 160	0 (0%)	10 (47.6%)	0 (0%)	6 (28.6%)	5 (23.8%)	

SatO2%	<85% (n=461) 85-93% (n=179) >93% (n=61)	0 (0%) 14 (7.8%) 48 (78.7%)	283 (61.4%) 150 (83.8%) 9 (14.8%)	44 (9.5%) 5 (2.8%) 0 (0%)	42 (9.1%) 5 (2.8%) 0 (0%)	92 (20%) 5 (2.8%) 4 (6.6%)	0.000*
RR	12-20 (n=61) 21-29 (n=277) 30-35 (n=198) >35 (n=165)	29 (47.5%) 26 (9.4%) 7 (3.5%) 0 (0%)	28 (45.9%) 193 (69.7%) 123 (62.1%) 98 (59.4%)	0 (0%) 11 (4%) 21 (10.6%) 17 (10.3%)	0 (0%) 15 (5.4%) 19 (9.6%) 13 (7.9%)	4 (6.6%) 32 (11.6%) 28 (14.1%) 37 (22.4%)	0.000*
qSOFA score	0 (n=66) 1 (n=491) 2 (n=136) 3 (n=8)	25 (37.9%) 31 (6.3%) 6 (4.4%) 0 (0%)	38 (57.6%) 316 (64.4%) 83 (61%) 5 (62.5%)	0 (0%) 42 (8.6%) 6 (4.4%) 1 (12.5%)	0 (0%) 38 (7.7%) 9 (6.6%) 0 (0%)	3 (4.5%) 64 (13%) 32 (23.5%) 2 (25%)	0.000*
WBC	< 4400 (n=46) 4400-11000 (n=374) >11000 (n=281)	13 (28.3%) 35 (9.4%) 14 (5%)	28 (60.9%) 255 (68.2%) 159 (56.6%)	2 (4.3%) 24 (6.4%) 23 (8.2%)	2 (4.3%) 20 (5.3%) 25 (8.9%)	1 (2.2%) 40 (10.7%) 60 (21.4%)	0.000*
Neutrophils (%)	<40% (n=18) 40-70% (n=106) >70% (n=577)	4 (22.2%) 28 (26.4%) 30 (5.2%)	11 (61.1%) 62 (58.5%) 369 (64%)	0 (0%) 3 (2.8%) 46 (8%)	1 (5.6%) 3 (2.8%) 43 (7.5%)	2 (11.1%) 10 (9.4%) 89 (15.4%)	0.000*
Lymphocytes (%)	<20% (n=593) 20-40% (n=83) >40% (n=25)	39 (6.6%) 18 (21.7%) 5 (20%)	376 (63.4%) 51 (61.5%) 15 (60%)	45 (7.6%) 3 (3.6%) 1 (4%)	43 (7.3%) 2 (2.4%) 2 (8%)	90 (15.2%) 9 (10.8%) 2 (8%)	0.000*
Cr (mg/dL)	< 0.7 (n=58) 0.7-1.36 (n=417)	9 (15%) 41 (9.8%)	27 (46.6%) 269 (64.5%)	2 (3.4%) 31 (7.4%) 16 (7.1%)	4 (6.9%) 24 (5.8%) 19 (8.4%)	16 (27.6%) 52 (12.5%)	0.010*

	>1.36 (n=226)	12 (5.3%)	146 (64.6%)			33 (14.6%)	
Ur (mg/dL)	<20 (n=25) 20-50 (n=340) >50 (n=336)	8 (32%) 38 (11.2%) 16 (4.8%)	12 (48%) 215 (63.2%) 215 (64%)	2 (8%) 22 (6.5%) 25 (7.4%)	1 (4%) 18 (5.3%) 28 (8.3%)	2 (8%) 47 (13.8%) 52 (15.5%)	0.000*
LDH	<240 (n=7) 240-480 (n=134) >480 (n=560)	1 (14.3%) 27 (20.1%) 34 (6.1%)	4 (57.1%) 83 (61.9%) 355 (63.4%)	2 (28.6%) 11 (8.2%) 36 (6.4%)	0 (0%) 9 (6.7%) 38 (6.8%)	0 (0%) 4 (3%) 97 (17.3%)	0.000*
INR	<1.1 (n=510) 1.2-1.9 (n=170) 2-3 (n=15) >3 (n=6)	48 (9.4%) 11 (6.5%) 3 (20%) 0 (0%)	333 (65.3%) 97 (57.1%) 10 (66.7%) 2 (33.3%)	35 (6.9%) 13 (7.6%) 1 (6.7%) 0 (0%)	25 (4.9%) 21 (12.4%) 0 (0%) 1 (16.7%)	69 (13.5%) 28 (16.5%) 1 (6.7%) 3 (50%)	0.011*
PaO2/FiO2 Ratio	<100 (n=211) 100-200 (n=246) 200-300 (n=159) >300 (n=85)	1 (0.5%) 2 (0.8%) 8 (5%) 51 (60%)	98 (46.4%) 178 (72.4%) 136 (85.5%) 30 (35.3%)	22 (10.4%) 22 (8.9%) 5 (3.1%) 0 (0%)	23 (10.9%) 19 (7.7%) 5 (3.1%) 0 (0%)	67 (31.8%) 25 (10.2%) 5 (3.1%) 4 (4.7%)	0.000*
Glu (mg/dL)	<75 (n=11) 75-110 (n=156) 110-250 (n=365) >250 (n=169)	1 (9.1%) 33 (21.2%) 24 (6.6%) 4 (2.4%)	6 (54.5%) 95 (60.9%) 235 (64.4%) 106 (62.7%)	1 (9.1%) 6 (3.8%) 25 (6.8%) 17 (10.1%)	0 (0%) 5 (3.2%) 31 (8.5%) 11 (6.5%)	3 (27.3%) 17 (10.9%) 50 (13.7%) 31 (18.3%)	0.000*
ALT(U/L)	<41 (n=504) >41 (n=197)	52 (10.3%) 10 (5.1%)	321 (63.7%) 121 (61.4%)	36 (7.1%) 13 (6.6%)	24 (4.8%) 23 (11.7%)	71 (14.1%) 30 (15.2%)	0.005*

AST(U/L)	<38 (n=388) >38 (n=313)	45 (11.6%) 17 (5.4%)	247 (63.7%) 195 (62.3%)	26 (6.7%) 23 (7.3%)	18 (4.6%) 29 (9.3%)	52 (13.4%) 49 (15.7%)	0.008*
CRP (mg/dL)	< 0.5 (n=12) 0.5-5 (n=195) 5.1-20 (n=316) 20.1-50 (n=115) >50 (n=63)	2 (16.7%) 29 (14.9%) 22 (7%) 9 (7.8%) 0 (0%)	10 (83.3%) 140 (71.8%) 190 (60.1%) 66 (57.4%) 36 (57.1%)	0 (0%) 9(4.6%) 29 (9.2%) 9 (7.8%) 2 (3.2%)	0 (0%) 10 (5.1%) 45(14.2%) 24(20.9%) 22(34.9%)	0 (0%) 7 (3.6%) 30 (9.5%) 7 (6.1%) 3 (4.8%)	0.000*
Clinical outcomes	Improvement (n=415) Long-term sequelae (n=25) Death (n=261)	59 (14.2%) 2 (8%) 1 (0.4%)	323 (77.8%) 13 (52%) 106 (40.6%)	24 (5.8%) 7 (28%) 18 (6.9%)	4 (1%) 0 (0%) 43 (16.5%)	5 (1.2%) 3 (12%) 93 (35.6%)	0.000*

- The Syrian civil war negatively affects the healthcare systems especially during COVID-19 pandemic.
- The highest risks for mortality are males over 60 years with multiple comorbidities .
- WBC, lymphocyte, INR, LDH, AST, ALT, and Glu values are a prognostic biomarkers.

Annals of Medicine and Surgery

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Ethical Approval

Research studies involving patients require ethical approval. Please state whether approval has been given, name the relevant ethics committee and the state the reference number for their judgement.

The study was approved by ethics committee of Damascus University.

Consent
Studies on patients or volunteers require ethics committee approval and fully informed written consent which should be documented in the paper.

Authors must obtain written and signed consent to publish a case report from the patient (or, where applicable, the patient's guardian or next of kin) prior to submission. We ask Authors to confirm as part of the submission process that such consent has been obtained, and the manuscript must include a statement to this effect in a consent section at the end of the manuscript, as follows: "Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request".

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The obligation of written informed consent was waived by Damascus University's ethics committee due to the nature of the disease being studied and the urgent need for data collection.

Author contribution

Please specify the contribution of each author to the paper, e.g. study concept or design, data collection, data analysis or interpretation, writing the paper, others, who have contributed in other ways should be listed as contributors.

HH considered the principle author as he set the conception and design of this study, coordinated the work, participated in collecting the data, following the patients, analyzing the data, interpretation of the data, writing the first draft, and revising the final draft. HT participated in collecting the data, following the patients, analyzing the data, interpretation of the data, writing the first draft, and revising the final draft. EZ participated in collecting the data, following the patients, analyzing the data, interpretation of the data, writing the first draft, and revising the final draft. AT participated in collecting the data, interpretation of the data, writing the first draft, and revising the final draft. HA participated in editing and revising the final draft. MH supervised this study, participated in interpretation of the data, editing the first draft, and revising the final draft.

All the authors read and approved the final manuscript**.**

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In accordance with the Declaration of Helsinki 2013, all research involving human participants has to be registered in a publicly accessible database. Please enter the name of the registry and the unique identifying number (UIN) of your study.

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1. Name of the registry: Clinical Characteristics and Prognosis of COVID-19 Patients in Syria: A cross-sectional Multicenter Study

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The Guarantor is the one or more people who accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish

All the listed authors